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MEMOIRS
OF THE
GEOLOGICAL SURVEY
OF
THE UNITED KINGDOM.

Figures and Descriptions

ILLUSTRATIVE OF
BRITISH ORGANIC REMAINS.

DECADE III.

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NOTICE.

PALÆONTOLOGICAL researches forming so essential a part of geological investigations, such as those now in progress by the Geological Survey of the United Kingdom, the accompanying plates and descriptions of British Fossils have been prepared as part of the Geological Memoirs. They constitute a needful portion of the publications of the Geological Survey, and are taken from specimens in the public collections, or lent to the Survey by those anxious to advance this branch of the public service.

The plan proposed to be followed in the work, of which this Decade forms a part, is as follows :—

To figure in elaborate detail, as completely as possible, a selection of fossils, illustrative of the genera and more remarkable species of all classes of animals and plants the remains of which are contained in British rocks ; to select especially such as require an amount of illustration which, to be carried out by private enterprise, would require a large outlay of money, with little prospect of a return, and a long time to accomplish, but which, by means of the staff and appliances necessarily employed on the Geological Survey, can be effected at small cost, and with a rapidity demanded by the publication of the Maps and Memoirs of the Survey ; thus, it is hoped, affording an aid to those engaged in the sciences with which this work is connected, that they might not otherwise have possessed, and which may materially promote the progress of individual research.

H. T. DE LA BECHE,
Director-General.

*Geological Survey Office, Jermyn Street,
30th June, 1850.*

BRITISH FOSSILS.

DECADE THE THIRD.

THE third Decade of representations of British Fossils follows up the subject of the first, and continues the series of illustrations of the genera and species of extinct Echinodermata, especially those belonging to the orders *Asteriadae* and *Echinidae*.

The genera illustrated in this Decade are partly new, partly long-established ; so also with the species, some of the most remarkable of unpublished forms having been selected, as well as some of the commonest and best known fossils. Yet, even respecting those which are so familiar that their whole history is believed to have been long ago made out, there is so much to be cleared up, so many points of structure hitherto very imperfectly or not at all elucidated, and such an accumulation of synonyms, that their investigation is much more laborious, and occupies much longer time, than inquiries into entirely new types. Thus, three of the fossils figured and described in this Decade, *Hemicidaris intermedia*, *Galerites albogalerus*, and *Micraster cor-anguinum*, are so familiar to geologists and naturalists, so abundant and so well preserved, that authors do not hesitate to cite them without comment, as if they were free from any obscurity. Nevertheless, I may say confidently, that not until now has the literature of these well-known and often-described forms been cleared up, and many of the most important points in their organization made known. Common as they are, no representations of them, presenting sufficient details of their structure, have ever appeared before.

Among the new forms now first described and figured, some are of singular interest. Two of them, the *Lepidaster Grayii* and the *Tropidaster pectinatus*, are not only new as species, but unquestionably possess features entitling them to become the types of new genera. Of those

belonging to old genera, the *Uraster Gaveyi* is singularly interesting, presenting, as it does, the spectacle of a Liassic echinoderm, which so closely resembles the commonest star-fish now living in the British seas, that it can only be distinguished from it by a minute and critical comparison; and the *Hemicidaris Purbeckensis* is remarkable as being the first member of its tribe ever discovered in strata of the Purbeck series.

The species described and figured have been selected from formations of different geological epochs. From Silurian rocks *Lepidaster Grayii* has been taken; from older secondary strata, the two forms of *Hemicidaris*, the *Galerites (Holectypus) hemisphærica*, chosen on account of its being new to Britain, and also affording an excellent illustration of the sub-genus to which it belongs, and the *Dysaster ringens*, selected for the same reasons; also the new star-fishes, species of *Uraster* and *Tropidaster*, already alluded to. Of cretaceous fossils there are the critical *Galerites castaneus*, and the characteristic *Galerites albogalerus* and *Micraster cor-anguinum*.

A third series of illustrations of the fossil Echinoderms is far advanced, and in preparation for publication.

EDWARD FORBES.

June, 1850.

BRITISH FOSSILS.

DECADE III. PLATE IX.

DYSASTER RINGENS.

[Genus DYSASTER. AGASSIZ. (Sub-kingdom Radiata. Class Echinodermata. Order Echinidæ. Family Cassidulidæ.) Body sub-discoidal; ambulacra simple, continuous, radiant; the posterior lateral pair separated from the rest, and converging to form a summit distinct from that formed at the genital disk by the two antero-lateral and the anterior one; mouth sub-central, inferior; anus at the hinder extremity; tubercles perforate.]

SYNONYMS. *Dysaster ringens*, AGASSIZ, Ech. Foss. de la Suisse, 1st part, p. 5, t. 1, figs. 7-11 (1839); Cat. Syst., p. 3; DESOR, Monog. des Dysaster, p. 24, pl. 1, figs. 13-17; COTTEAU, Etudes sur les Echin. Foss., p. 46, pl. 2, figs. 10-13; AGASSIZ and DESOR, Cat. Rais. des Echin; Ann. des Sc. Nat., 3rd series, vol. viii., p. 33. *Collyrites ringens*, DESMOULINS, 3rd Mem. sur les Echin., p. 368. *Dysaster Eudesii*, AGASSIZ, Cat. Syst., p. 3; DESOR, Monog. des Dysaster, p. 23, pl. 1, figs. 5-12. *Dysaster subringens*, M'Coy, Annals Nat. Hist., 2nd series, vol. ii., p. 415 (1848).

DIAGNOSIS. *D. testâ depressâ orbiculari, seu subpentagonali, lateribus tumidis, dorso convexiusculo, vertice plerumque centrali; ambulacris postero-lateralibus supra anum convergentibus; ano in sulco terminali; ventro concavo, areis interambulacralibus tumidis, areâ postica gibbâ, ore subcentrali.*

The curious genus to which the fossil before us belongs, although of very late constitution, having been first founded by Agassiz in 1834, has scarcely as yet settled down into a decided position among sea-urchins. The species most anciently known were styled *Spatangites* by Leske, assigned to *Ananchytes* by Lamarck, and *Nucleolites* by Munster. Since *Dysaster* was constituted for their reception, it was first placed among the "*Spatangoides*" by Agassiz, referred to the "*Clypeastroides*" by Desor, and back again to the former family by Agassiz and Desor jointly. Very recently, M. Gustave Cotteau, in his excellent work on the fossil *Echinidæ* of the department de L'Yonne, has inclined to regard them as members of the Cassidulidæ. After an earnest consideration of their structural relations, I do not hesitate to place them in the last-named family, in which they have distinct and close affinity with *Hyboclypus* and *Galerites*. The form of the ambulacra, combined with the structure of the mouth, is sufficient to warrant such a conclusion. In the foreign *Dysaster semiglobus* (*Nucleolites*

semiglobus of Munster) we see a species which is truly intermediate between such a *Galerites* as *G. castaneus* and the more typical forms of *Dysaster*.

British specimens of this *Dysaster* vary in outline from nearly completely circular to subpentagonal, with even an approach to oblong; every gradation between the two extremes of form is common. The dorsal surface is very uniformly and gently convex, though varying considerably in altitude. The highest point of the back is almost always a little behind the centre; very rarely a specimen is met with having it still further back. The sides are tumid, and in the subpentagonal specimens, slightly and very obtusely angulated by the prominence of the interambulacral spaces. The ventral surface is concave in the region of the mouth, very convex, and almost nodulose in the interambulacral spaces; the ambulacral areas being depressed. The odd or anal interambulacral area is peculiarly prominent and gibbous. Its extremity is squared by the inferior terminations of two ridges which bound the conical groove, in the upper part of which, nearly, but not quite on a level with the dorsal surface of the body, is lodged the anus.

The three anterior ambulacra converge nearly in the centre of the back. The antero-laterals are separated on each side from the anterior ambulacrum by a perforated genital plate; that of the left side is granulated in its upper part, being the madreporiform plate. Behind the summits of the antero-lateral ambulacra, which curve gently forwards before they terminate, are the other two genital holes. The eye-holes are very small, but distinctly terminate the three anterior ambulacra; the other two seem to be removed from the disk to the terminations of the postero-lateral ambulacra, but of this I have not clearly satisfied myself.

The ambulacra are all complete, running from the mouth to their dorsal terminations; on the back they are on a level with the interambulacral plates. The number of ambulacral plates exceeds that of the interambulacral plates by four or five times. The three anterior ambulacra are narrower than the two posterior, which are often nearly but not quite twice as broad as the former; the proportionate width, however, as I have satisfied myself by measurements, is not constant. The narrowest ambulacrum towards its summit is the anterior one, but it widens out lower down. Each pair of ambulacral plates is perforated at its outer side by a pair of pores. Near the mouth the ambulacra widen, and the pairs of pores are ranked in about three oblique series of three pair in each, but their relations to the plates there are obscure. All the plates, whether ambulacral or interambulacral, are minutely granulated, and among the granules are interspersed very small spiniferous tubercles with areolæ and punctated summits; but whether the bosses on which they stand are crenulated I have not been able to make

out satisfactorily in this species. The tubercles are most numerous below. The spines are unknown.

The mouth and anus are of about equal dimensions, being each in diameter rather less than one-eighth of the length of the shell. The position of the mouth is subcentral, but sometimes the eccentricity is considerable. It is very obscurely decagonal, but seems to the eye as if round. No traces of dental armature have as yet been discovered.

Varieties.—The specimens we have figured accord best with the representations of the *Dysaster Eudesii* of Agassiz, as figured in the Monograph by Desor. Many English examples are, however, sufficiently flattened out to represent very perfectly the *ringens* of that work. In the description of the species there given it is implied that the latter differs from the former importantly in the circumstance of its anterior ambulacra being narrower than the posterior; the figures of *D. Eudesii*, however, represent the ambulacra as presenting similar relative proportions with those of *ringens*. M. Cotteau refers this *Dysaster* of the “oolite ferrugineuse” of the Tour-du-Pré to the *ringens*. His figure would serve as a good representation of some of our English specimens. He remarks that he and M. Moreau have collected in a single locality a suite of examples of *D. ringens* presenting various degrees of tumidity and more or less circularity of outline, and among which were all the gradations conducting to *D. Eudesii* “qui ne serait alors qu’une variété plus petite et plus allongée du *Dysaster ringens*.” The experience of the Survey collectors leads me to the same conclusion.

Professor M'Coy, in his memoir “On some new Mesozoic Radiata,” in the “Annals of Natural History” for December, 1848, has enumerated *D. Eudesii* as a British species from the inferior oolite of Dundry and Bridport. At the same time he describes two new species of *Dysaster* under the names of *D. symmetricus* and *D. subringens*; the former “not uncommon in the inferior oolite of Bridport,” the latter “not uncommon in the inferior oolite of Dundry and Leckhampton.” After a careful perusal of his descriptions, I am obliged to surmise that the latter species (an opinion supported, after comparison with the original specimen, by Mr. Salter), is a variety of the species now described. I can find no character in his descriptions which would warrant their specific separation; and, as in the case of his *subringens*, he compares it with *ringens* and *Eudesii*, distinguishing it from the former “by its greater gibbosity and the less prominence of the ridges on the under side,” and from the latter “by the disproportionate narrowness of the three anterior ambulacra as in the *D. ringens*,” characters which vary in every specimen, I do not hesitate to include it among the synonyms of *ringens*. In the same paper he mentions *Dysaster avellana*, of Agassiz, as also from the inferior oolite of Bridport; I cannot satisfy myself, after examining

Desor's figures and descriptions, that the species in question is distinct from *D. bicordatus*; and certainly, industriously as the Survey collectors have ransacked the inferior oolites of Dorsetshire, I have never received any other species of *Dysaster* from thence, except *Dysaster ringens*, as here described, and *Dysaster bicordatus*, a very different form, of which Mr. M'Coy's *D. symmetricus* is an oval variety.

The following table of the dimensions of eight specimens, in inches and twelfths, from the Bridport oolite, will show the variable proportions of this species.

	A.	B.	C.	D.	E.	F.	G.	H.
Length . .	$1 \frac{1}{12}$	$1 \frac{1}{12}$	$0 \frac{11}{12}$	$0 \frac{8}{12}$	$0 \frac{9\frac{1}{2}}{12}$	$0 \frac{9}{12}$	$0 \frac{10}{12}$	$0 \frac{10}{12}$
Breadth . .	1	$1 \frac{1}{12}$	$0 \frac{11}{12}$	$0 \frac{8}{12}$	$0 \frac{8}{12}$	$0 \frac{9}{12}$	$0 \frac{10}{12}$	$0 \frac{9\frac{1}{2}}{12}$
Thickness .	$0 \frac{6}{12}$	$0 \frac{8}{12}$	$0 \frac{7}{12}$	$0 \frac{5}{12}$	$0 \frac{5}{12}$	$0 \frac{5}{12}$	$0 \frac{5}{12}$	$0 \frac{6}{12}$

Localities and Geological Position.—This species has been collected abundantly by Mr. Bristow and Mr. Gapper during the examination in the course of the Geological Survey of the INFERIOR OOLITE of Somersetshire and Dorsetshire. It appears to occur chiefly in the sands of that formation, and is very generally the companion of *Galerites (Holec-typus) hemisphærica*. Among the localities from whence I have examined specimens are the following: Lyttelton-hill, near South Cadbury; between Sherborne and Yeovil; Little Windsor; Stoke Knaps. Greenland (in the ferruginous beds), Loders; Whatley; Smokeham; Honeycombe; Bradford Abbas; Beaminster; Shipton Gorge, where it is accompanied by *Dysaster bicordatus*; Burton Bradstock; Burton Cliffs (top beds); near Bridport Harbour; Chideock-hill; Mapperton; West Swillets. The places mentioned are included in sheets 18 and 19 of the Ordnance Survey Map of England.

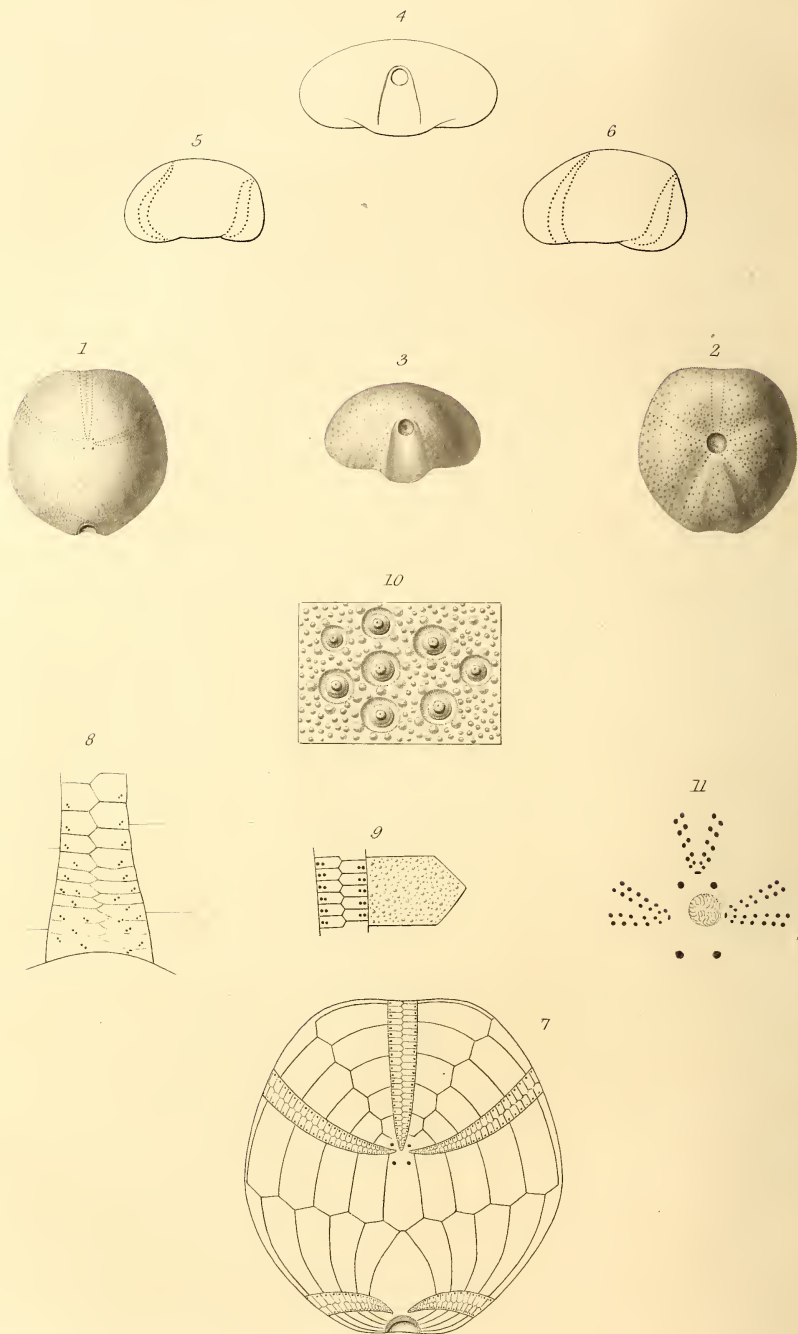
Foreign Distribution.—In the "*Marnes Vesuliennes*" of the Jura (Agassiz); in the ferruginous oolite of Normandy (Deslonchamps); in the ferruginous oolite of the Tour-du-Pré (Cotteau).

EXPLANATION OF THE PLATE.

- Fig. 1. View of body seen from above.
- Fig. 2. Underside of same specimen.
- Fig. 3. Terminal view.
- Fig. 4. Terminal view of a wider specimen.
- Figs. 5 and 6. Profile of variations in proportions of specimens.
- Fig. 7. Diagram of structure of test, the plates of the disk and those above the anus not made out.
8. Oral terminations of the ambulacra, showing the triplication of the pores.
9. Relative proportions of ambulacral and interambulacral plates, taken from the sides.
10. Tubercles and granules of surface.
11. Genital disk, terminations of anterior ambulacra, and madreporiform plate.

June, 1850.

EDWARD FORBES.



DYASTER RINGENS—*Agassiz*.

VAR. EUDESII